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ABSTRACT

This paper presents a discussion, based on current research, of what can be done to help children achieve the highest level of cognitive development (Piaget's formal operations). The four factors which Piaget found to be involved in cognitive development are discussed in relation to recent research. These factors include: (1) organic growth and maturation, (2) exercise and acquired experience in action on objects, (3) social interaction and transmission, and (4) equilibration (self-regulation). Ten applications derived from theoretical research pertaining to these fundamental factors are presented as they relate to the development of training programs and teaching techniques appropriate in helping children achieve fuller cognitive development. Topics include the nature of the learning process, social interaction, teacher expectations, the value and structure of intervention programs, the degree to which children's thinking is subject to adult influence, and mastery learning. (ED

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Physical and Acquired Experience in Action Upon Objects

Presumably a child who never feels a ball, never plays with it, i.e., never acts upon it, will not learn the physical properties of a ball, that it is round, that it rolls and bounces. According to Piaget (1970) the child needs two different kinds of experience. Though they look very much alike these two are different and their difference is important. The first is *physical* experience, e.g., in playing with pebbles of different sizes the child learns that they are hard, rounded and smooth, different in length, width and thickness. Perhaps he also learns the relationship between weight and volume of physical objects, that the larger the pebbles the heavier they are. And one by playing with physical objects he gets physical experience, learning about the properties of the objects themselves and about the physical world which has weight and volume among its other attributes. The child acquires the second kind of experience, the *logico-mathematical*, directly "playing" with the pebbles, either as a result of an unplanned experience with pebbles in the park or through an arranged experience at a nursery school. She finds that when she forms a circle out of the pebbles she counts them either direction, clockwise or counterclockwise, she gets the same number. Similar, that when she puts them into two lines of six pebbles each, equally spaced, they are the same, but that even when she "processes" one line of them together so that it looks very short, it still has the same number as the long one. She learns by her actions on the pebbles that she can [illegible] regardless of the spread of elements. While the physical experience through which she learned the physical properties of pebbles, the logico-mathematical is not dependent upon pebbles; she could learn

In an international study of achievement in mathematics in twelve countries (Husen, 1967) males scored significantly higher than females at each of the three levels tested. These levels are age 13, the pre-university level, and the terminal year for those who did not go on to universities.

In an international study of achievement in science in nineteen countries (Comber and Keeves, 1973) males scored significantly higher than females at each of the three levels tested. The levels are ages 10, 14, and the terminal year of secondary school.

However, in an international study of reading in fifteen countries (Thorndike, 1973) correlations of reading comprehension scores with sex are small and inconsistent from country to country. In the United States the correlation of .05 favors the females. In a majority of the countries the girls scored higher than the boys though the difference was small. Nevertheless, the findings of this study are consistent with other evidences of female superiority in verbal ability.

How are these differences in performance to be explained? Sex role expectancy from infancy generates differential experience. Aggressive exploration which is associated with problem solving (Sontag, Baker and Nelson, 1958) has been much more a component of male than female experience. The academic subjects most dependent upon logical thinking (e.g., mathematics and the physical sciences) are also more associated with masculine role expectations and fewer females than males participate in these subjects. Women tend to choose subjects less dependent upon logical thinking (e.g., foreign languages and some of the arts) and have more liberal majors.

The differences between the scores of men and women on logical problems are probably not due to inherent, genetic or constitutional factors but to experiential ones.* If that is so, namely, that more college women could be at the formal level given different life experiences than it follows that the possibility exists that the same may be true for other people, i.e., other women, girls, boys and men. Thus, the second interpretation is a reasonable one to explain the limitations in the performance of those who did not attain formal operations. It may be due to cultural or experiential factors whereby high-level logical thinking is not required, or not rewarded or fostered, or is discouraged by circumstances.

Social Interaction and Progression

Anthropologists have studied extensively the effect of cultural factors on thinking. Prior to the work of Franz Boas (Cole, Gay, Glick, Sharp, 1971), it was generally believed that people who held primitive beliefs engaged in primitive thinking. Boas posited that everyday beliefs could be used to determine the thought processes of a people and in so doing challenged the generally held view that there was a primitive mentality. Anthropologists assume that "there are no fundamental differences in thought process among different groups whether these groups are differentiated along cultural or racial lines." (Cole et al, 1971). Four investigators recently studied the people of Liberia in Africa to address this question: How do people's thought processes relate to the culture in which they are raised and in which they live? Were psychologists sure that Piaget's progressive step which, on the one hand used psychological tools but avoided the absurdity of western psychologists

*As the development of the individual, the personality and experiential are inseparable and interactive.

using western-oriented tests to evaluate people in non-western cultures)
and on the other hand, they used ethnography but not by itself for
ethnography cannot discriminate between the mental product that is tradition
or custom (i.e., a belief passed on) and the mental product that is
reason. So ethnography is employed to identify "the kinds of activities
that people often engage in and hence ought to be skillful at dealing with."
From the results of this ethnographic analysis, they then devised the test
or experimental situations from which they were able to compare Eskimos with
non-educated Apollo people and both of these with Americans. Partly in their
observations they found that Apollo people were superior to Americans in
performing certain kinds of tasks and inferior in others. To illustrate, the
Apollo did exceptionally well in estimating various amounts of rice but
performed poorly and inconsistently in measuring lengths. Rice farming
not only is essential to their survival but also integral to the culture of the
people. Measurement of length has no standard system in Apollo where a
different metric system is used for different items (e.g., cloth, logs, sticks.

People are skillful at doing what they are accustomed to do, at
doing those things that are demanded for survival, valued by their culture,
for which they are rewarded, and which they experience as relating to them.

In their report of the study the investigators included an excerpt
from Prescott's "Water and the Gulf." This is an exchange between two
characters, the bird and the duck.

"What kind of a bird are you if you can't fly?"
chirped the bird. "What kind of a bird are you
if you can't swim?" replied the duck.

How can we evaluate the performance level of these characters, by measuring their
ability to fly or to swim? Only if we take the position that one bird can be

are applied than in the existence of a process in one cultural group and its absence in another." Applying this major conclusion to the stages of cognitive development as we know them from Piaget we would infer the following. Children and adolescents who are not up to the stage roughly appropriate to their chronological age may in fact actually possess the structures that have not been revealed by tests or tasks administered. This would be true especially for culturally-different children (which in the United States means racial, ethnic or social class difference), but possibly for a large number of others. The investigators whose work we have examined say that the implication of their conclusion is that we must find the conditions under which various processes (or operations) are manifested and then see that these conditions occur in our schools. Applying their African findings to the American scene, in particular to minority groups that have not fared well on psychological tests or in school achievement, they reject the notion that members of such groups suffer from a general intellectual deficit or from social or psychological conflicts. They support the position of Labov (1970) who concluded from his studies that nonstandard English does not imply substandard thinking, and that--like the people of Kpelle--minority children in whom cognitive skills are presumably absent on the basis of tests and school performance, use them in naturally occurring situations.

What this has meant in the case of girls and women? What it has been found to mean when the their cognitive skills appropriate to their age would be tested in terms of tasks in those activities that were traditionally favored and rewarded, such as the arts and humanities, clothing design, homemaking, child care, and the teaching of children rather than in the context of materials that have been and even now still are so alien to the lives and thoughts of women as reading or talking or repairing an automobile motor?

There is still another interpretation of the Piaget findings, namely, that those who did not have the benefit of formal schooling were lacking in the mental structure necessary to solve the experimental problems. Coupled with this would be the finding that, given education, the Wolof acquired the necessary operations. Applying this to women, their inferiority would be attributed to a lack of structures which could however be formed through learning experience.

One study on causality seems very appropriate at this point because it contains comparisons between cultures and sexes. Jahoda asked children in 1958 and another group in 1960 the same question: What makes a bicycle move? The subjects were Scottish and Ghanian school children. The Ghanian children were living in a pre-industrialized society in relation to the other comparison groups, the post-industrialized Ghanians. The rate of improvement of the Ghanian boys, but not of the girls, was identical to and the same as that for the Scottish children. In both cultural groups the girls lagged behind the boys, with the Ghanian girls scoring lower than the Scottish girls.

From a practical point of view it hardly matters whether the Ghanians and the girls score lower because of the absence of the necessary operations or because of unfamiliarity with bicycles; it does not matter providing that given experience with bicycles and other mechanical objects they become able to deal with problems about causality.

Conclusion

Piaget's work refers typically to self regulation. The individual organism is capable of making compensations in response to external disturbances.

Some of the young child's needs which are manifested as bodily disequilibria are satisfied as a result of the child's trial and error searching activities. Later when a state of tension is caused by a change in the environment the individual achieves equilibrium by inventing a solution such as beginning to use abstract classificatory activities instead of just concrete ones, now enabling the child to perform operations like reversibility.

The authors of a recent paper (Elkind, Metzel and Coe) use an apt metaphor in explaining that equilibration is the individual's mechanism for regulating his interactions with the environment. Equilibration insures, they point out, that "he is neither enslaved by the environment nor by his own ego-centrism." "The child takes in, assimilates, all that he can manage, which means all that his mental structures enable him to accommodate. The Genevan study using the model of a town illustrates this well (See Figure 1). The child stands first on platform A. Asked what he sees he says the school and the city hall. Then he stands at B and he says he sees the post office and the park. Next he's asked: "If your friend was standing over there at A where you were standing before what would he see?" The child answers, "the post office and the park." He cannot yet decenter himself from his own perceptions.

If he cannot yet assimilate another's perspective of an experience, he can, however, recognize and absorb the full effect of another child's anger if he takes that child's bike or if he cheats in a game. That creates disequilibrium and drives him toward seeing the point of view of others.

Disequilibrium creates discomfort. When we are frustrated in our attempt to understand some complex phenomenon such as income tax regulations or some Piagetian concept, we experience discomfort. If the discomfort is strong

enough and especially if what we do not yet understand is important enough, the state of disequilibrium will persist until we have mastered the concept, i.e., until we are able to assimilate something from the environment and make it part of our operating structures.

But can this happen, however, unless the desire for and interest in experience of this kind is strong, and strong enough to outweigh countervailing forces? Why would a girl--at least up to a dozen years and so--be strongly interested in activities that sharpened her intellect when in fact the messages she received from those whose values were important to her, told her to avoid achieving mental prowess. Messages came from her parents, her peers (Tannenbaum), and her guidance counselors (Schwartz). Bright young women paid a price for going against the tide; in fact they paid a price either way.

The same explanation may be applied to oppressed groups before they have raised their consciousness to an awareness of what their enforced position has done to their intellectual development. Appalachian mountain children born into poverty with the rightful expectation of dying in poverty are not likely to experience tension if they are unable to conserve weight or volume or to use implications and disjunctions in their reasoning. They are not likely to muster much energy for the kinds of school learning experiences that provide some of the conditions to acquire those concepts and operations.

The attainment of new, more advanced cognitive structures entails the reorganization of existing structures. Conservation of number presumably comes about as a result of disequilibrium over the inconsistencies one finds experienced between repeated observations. (These pennies lined up are the same as those piled up; sometimes one has more and sometimes less. But look, now they're

the time. At one point these seeming conflicts are not of the slightest concern. They simply are not in conflict. Then comes a slight awareness of the conflict, then growing awareness, then an intuition about sameness, and finally conservation when the different viewpoints of length and number are coordinated. Changes of this qualitative order take time, they take experience, and in the first place they take interest in interacting with the objects, in this case the pebbles, and interest in dealing with the intellectual problems presented by the actions of an adult.

Disequilibration in children can arise only through experience with things or people with which they are permitted or encouraged to interact. For children, being permitted or encouraged to have such new experiences means through the behavior of adults. Experiences of that kind are needed especially by those who have not acquired the operational thinking appropriate to their chronological age.

Training Programs

Such training structures as the permanence of objects, the conservation of quantity, or reversibility may be thought of as fundamental knowledge in contrast with what we might call school knowledge. Success in school is geared to the acquisition of information and skills, not of fundamental knowledge such as conservation of number; however, the underlying knowledge of number is essential if skills like addition are to mean anything at all to the child.

The research literature does not provide clear guidelines on the advisability of training programs of any kind. In one recent review of conservation studies, for instance, Beilin and Kagan (1971) concluded that short-term

training experiences could induce conservation. In a more recent one, the reviewer (Adam, 1974) challenged their conclusion and argued that the results of the studies have been "ambiguous and inconclusive." She recommended for a variety of reasons that training experiments be conducted longitudinally, i.e., over long periods of time. This is reasonable. The analysis of change such as the transition from early to mid-childhood thinking reveals that time, and the activities of life that occur meanwhile, are essential to change. There are no snap-of-the-finger interventions in mental functioning, as both the practicing psychologist and the practicing teacher can attest. That does not mean that time itself, if that could be imagined, is sufficient--just that time is a necessary, although not a sufficient factor. It is what occurs in the interim that can influence both the quality and the speed of change. There are two ideas about what can be done.

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longer with thinner--the clay gets longer but ah, yes, it gets thinner, so it is the same amount as before. I played hide and seek with two and one-half year old Davy. He counted to ten while I hid. He found me really hidden and was delighted by it. Then I faced a wall and counted to ten. He presumably went to hide. Where? Right out in the open and he continued to do that despite my behavior in hiding and my suggestions to him. He saw me hidden; he could not yet picture himself in my position to see himself hidden. No lectures from a teacher would help. Not only is it fruitless for the teacher to try, it is damaging to the child, because it teaches the child not to trust his own thinking--not to understand the world through his own perceptions but through others.

3. Social interaction is an essential part of the process of acquiring fundamental knowledge. In fact Piaget often mentions that children left alone to interact with other children help themselves. Children thereby develop an awareness of different points of view; they come to see that their perspective is not the only one; they lose their egocentricity. Questions raised by teachers about the child's experience with objects, or with other children, help raise the child's awareness; they lend one child to reflect on the experiences. Situations arranged by the teacher encourage the children to discuss or act out their thoughts and observations.

4. Adults can be subject to their own brand of egocentric thought when they evaluate the comment of the child. To the child who sees an array of five pennies spread over a foot, or more than an equal number spread over six inches, a denial by the adult just shakes her confidence in herself and teaches her to be guarded about her perceptions. When the little boy of under two saw his older sister holding a cookie he took his half-eaten one

to his father and said, "Daddy fix." This little child isn't "wrong"; he's just thinking like a little child.

Here is an example of the thoughts of a five year nine month old child as excerpted from Piaget's (1929) report.

> "Where does the dream come from--from in or from outside?--From outside.--When you are in bed and you dream, where is the dream?--In my bed, under the blanket. I don't really know. If it was in my stomach(!) the bones would be in the way and I shouldn't see it.--Is the dream there when you sleep?--Yes, it is in the bed beside me.--Is the dream in your head?--It is I that am in the dream: it isn't in my head (!). Where do dreams come from?--They happen--in the room and afterward they come up to the children. They come by themselves.--If I were in the room too should I see it?--No, grownups don't ever dream."

These concepts are "correct" and appropriate to the developmental level of the child. Sometimes Piaget has given an example of how the child's thinking, when different from the adults or different from objective reality, should not be pressed. The teacher in an elementary school in a low-income neighborhood asked, "How long is a mile?" The child answered "A long, long way to walk." The teacher responded, "No, it's 5280 feet."

3. The kind of learning experiences that fosters fundamental cognitive growth cannot be given as one-shot or one-year interventions. They should characterize all the years of schooling. The mental manipulations for adolescents are largely of symbols rather than objects but all of the same principles of action on them and discussion about them are valid. Too often students are told the meaning of, let us say, evolution, freedom, values, etc. without the opportunity to explore, examine, pose questions, and discuss and experiment. Hence the principles and concepts remain unexamined and unexamined.

Sinclair tells the story of the youngster who having been told to learn that World War I began in 1914, perplexed the teacher by asking her, "What was 1914?" It is not very often that children feel free to reveal publicly those age-appropriate lacunae that frequently give rise to embarrassment.

Short-term interventions have serious limitations. Many critics including educational researchers have declared Head Start a failure because a year or two or more later the children had lost some or all of their gains in comparison with the normative groups. How naive to expect anything different. That is equivalent to giving children of four or five a nourishing diet and expecting a year or two later when they are back to a malnutrition diet that they would still be just as healthy.

Father's role is a crucial one! A recent study of the major influences on the development of the young child throws some light on effective adult behavior. The investigators' (White and Watts) conclusion is hardly surprising: the mother's direct and indirect actions with regard to her one- to three-year old child, and especially during the critical second year, are the most powerful formative factors in the development of the pre-school child." Most women are capable of doing a first-rate job. They can do it without a college or even a high school diploma, without substantial economic assets and without a father in the house.

The effective mothers were found to provide their children with a responsive, pleasant and varied environment. They talked a great deal with their child. They provided access to many objects like toys or bottle caps, plastic refrigerator containers, shoes, magazines. There were things to

child, prone to interact with--or actually mother, though she was busily at work and did not hover over the child--and also television. Such mothers have high energy and imagination, and permissiveness combined with firmness in their treatment of the child. The implication for pre-school programs for the under-threes is to have a teacher very much like the effective mothers, among other things in not hovering over the child.

[illegible]. Intervention to induce cognitive development has been found to be successful when the child is in the transitional stage. If the child is close to the concrete operational level, then it is possible, [illegible] the course of relatively short periods of time of training (e.g., three sessions) to acquire conservation of quantity and after that with more practice, conservation of weight (Wallach, 1971; Sinclair, 1973). This is a very significant finding because it opens the way to facilitating development in those who are at a transitional stage, some of whom might not otherwise develop beyond that level or do so at a retarded rate.

This finding does not mean that it is impossible to influence the acquisition of particular or fundamental knowledge in children who are somewhat near a transition. It means only that it is impossible to observe the qualitative change of movement from one stage to another unless a person is at the transitional point.

[illegible] What is it that helps children develop? As will [illegible] Sinclair's (1973) report of an experiment. She used matched pairs of [illegible] in conversations with each other and the adult with contradictions, questions, perplexities and compromise solutions. All of these behaviors seem to help in the process of transition. Here is one example of a child responding to a problem:

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them, can work out problems under proper conditions. A girl was asked to add 25 and 482 which she proceeded to write this way:

$$\begin{array}{r} 25 \\ 482 \\ \hline \end{array}$$

She had memorized a set of rules but backwards because she did not understand them. Yet when she was given a written nine item addition problem, with items ranging from one to five digits, and was asked to guess how much it was, she demonstrated that she had sound methods of seeking solutions. Placed in a situation in which she was encouraged to be on her own, in fact, instructed to do so ("guess") this child revealed considerable knowledge of mathematics. On a computational level, Ginsberg said, she was very stupid, while on the heuristic level she was very bright. When he pointed up the contradiction between the answer she got when she applied the computational rule (backward one the answer when she "guessed" (i.e., used her own logic) she eventually had an "Oh, ha" insight: "Oh, I've got the place values the same way."

Ginsberg asked the kinds of questions that confronted the child with the contradictions. That was the beginning of her beginning to think about the rules and skills she had been using in rote fashion.

Working in a different field (English) with a different population (experienced teachers of English), Parker (Schwebel and Raph) reports experiences that have some parallels to Ginsberg's. The teachers were given two experiences: first, to engage in a writing task and to keep a record of their own process and experience; second, to go through a sequence of writing exercises and to keep the same running account of their experiences;

...ers, to read what practicing writers had written about their own writing processes. Then they were asked to compare their practices in the classroom with their own experiences and the reports of the authors. From this "hands on" experience they came to see that their strategies for the teaching of writing "were irrelevant, or antagonistic, to the ways in which pieces of writing, their own and others were made."

These teachers had another unsettling experience when Parker asked them to record for twenty minutes or so what they were experiencing of internal and external events. They were taken, that is, when their inadequate products --they could not handle the assignment--were compared with the papers of twenty 15 and 16 year old "basic track" students in Chicago, all reading below the fifth grade level. These adolescents were perceptive about their experiences, about what they were hearing, seeing, smelling, feeling and thinking. The "disadvantaged" students handled with ease an assignment that stumped the teachers. The teachers found their unsettling experiences useful in directing their attention to the selection of more appropriate assignments and class activities, in other words, to a reorientation of their way of teaching.

3. The question about the degree to which thinking is subject to adult influence is still very much of an open one. It is one of the several major differences between Piaget and the Soviet psychologists (Zaporozhets, et al, 1974) who are more sanguine about the possibility of greater influence. Eastern European psychologists, for example, are reported by Holloway (1973) have met with more success than Piagetians would have expected in using instructional methods to induce development. Especially after age four they have succeeded in facilitating the acquisition of fundamental knowledge

lies serration and conservation through learning experience. It remains to be seen whether these reports reflect different interpretations of "acquisition" or whether they are an important finding. In the meantime, those who work with children in home, school, day care center, clinic and hospital can learn from the successful changes brought about at transition levels, those parallel ones of a different kind through mastery learning discussed in the next section, and from such experiences as those of de Vaivron (1975) and her colleagues who set up a comprehensive program for children and their families from an inner-city slum area in New York. This was a collaborative effort between a psychiatric clinic in a hospital and a school district. A weak-hearted person would have retreated in finding that only one-third of the 11-year olds could perform the classification tasks that were expected of 6-year olds. The project went on. Teachers learned the role of a teacher whose goal was to use experience and situations to facilitate intellectual development. In the classroom arena, a teacher did not use a traditional kind of exercise that supposedly teaches differences in size, or seriation, e.g., "Give me the *large* jar of mayonnaise and the *small* can of coffee." Instead, she raised questions that compelled the children to reflect upon what they did, such as, "How come the coffee can is with the milk?" or questions that challenged them to recall or reconstruct a process, such as, "What did you do in the game you played today?"

The teacher planned a series of meetings about the fall season. [illegible] selected as the topic for one day. Aside from some of the obvious sensory experiences and the motor ones of peeling, cutting, eating, cooking them, the following were also built into the fall unit. Including

For those interested in basic intellectual development, mastery learning has several important meanings. First, it indicates how important time is as a differential factor among children. Second, it increases confidence about the human capacity to master intellectual tasks that were long believed unavailable to many people. Third, it underlines the importance of identifying the areas of learning (or development) that need attention. Fourth, and more tentatively than the others, we may infer that in the process of acting on new materials and new symbols, that had been meaningless before, children are acquiring basic knowledge, some of which is essential for success or learning in school. It remains to be seen to what extent cognitive development is stimulated by mastery learning.

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Bloom, B. S. Time and learning. American Psychologist 21, 9, 1974, 682-688.

Carroll, J. B. A model of school learning. Teachers College Record 64 (1963), 723-33.

Cole, M., Gay, J., Glick, J. A., Sharp, D. W. The cultural context of learning and thinking. New York: Basic Books, 1971.

Cooper, L. C. and Reaves, T. P. (Eds.) Science education in nineteen countries. New York: Wiley, 1973.

DeVeaugh, M. The use of clinical and cognitive information in the classroom. In Schwebel, M. and Raph, J. Piaget in the classroom. New York: Basic Books, 1973.

Elkind, D. Quantity conceptions in college students. Journal of Social Psychology. 1962, 57, 459-465.

Elkind, D., Hetzel, D. and Coe, J. Piaget and British primary education. Educational Psychologist. 1974, 11, 1, 1-10.

Hebb, D. O. Organization of behavior. New York: Wiley, 1949.
(See Bowlby on attachment: Holt, Rinehart, Ivan D.)

Husen, T. (Ed.) International study of achievement in mathematics (Vols. I and II) New York: Wiley, 1967.

Johnson, D. Understanding the behavior of bicyclists: A cross-cultural study of development changes after adolescence. International Journal of Psychology, 1968, 3 (2), 113-119.

Labov, W. The logic of non-standard English. In Language and poverty. Williams, F. (Ed.) Chicago: Markham, 1970.

Lovell, K. and Shuttleworth, D. E. Articles underlying the understanding of proportionality. Mathematics Teaching, 1964, 27, 5-9.

Mentzer, D. R., Bennett, J. W. Are colleges concerned with intellectual development? American Journal of Physics. 1971, 39, 1041-1042.

Piaget, J. The child's conception of the world. New York: Harcourt, Brace, 1929.

Piaget, J. Six psychological studies. New York: Random House, 1967.

Piaget, J. and Inhelder, B. The Psychology of the child. New York: Basic Books, 1969.

Pinard, A. Piaget's theory. In Mussen, P. H. (Ed.) Carmichael's Manual of child psychology, 3rd edition. New York: Wiley, 1970.

Schwartz, J. Guidance counselor sex biases in the occupational recommendations made to female students of superior intelligence. Ph.D. dissertation (unpublished), New York University, 1974.

Watts

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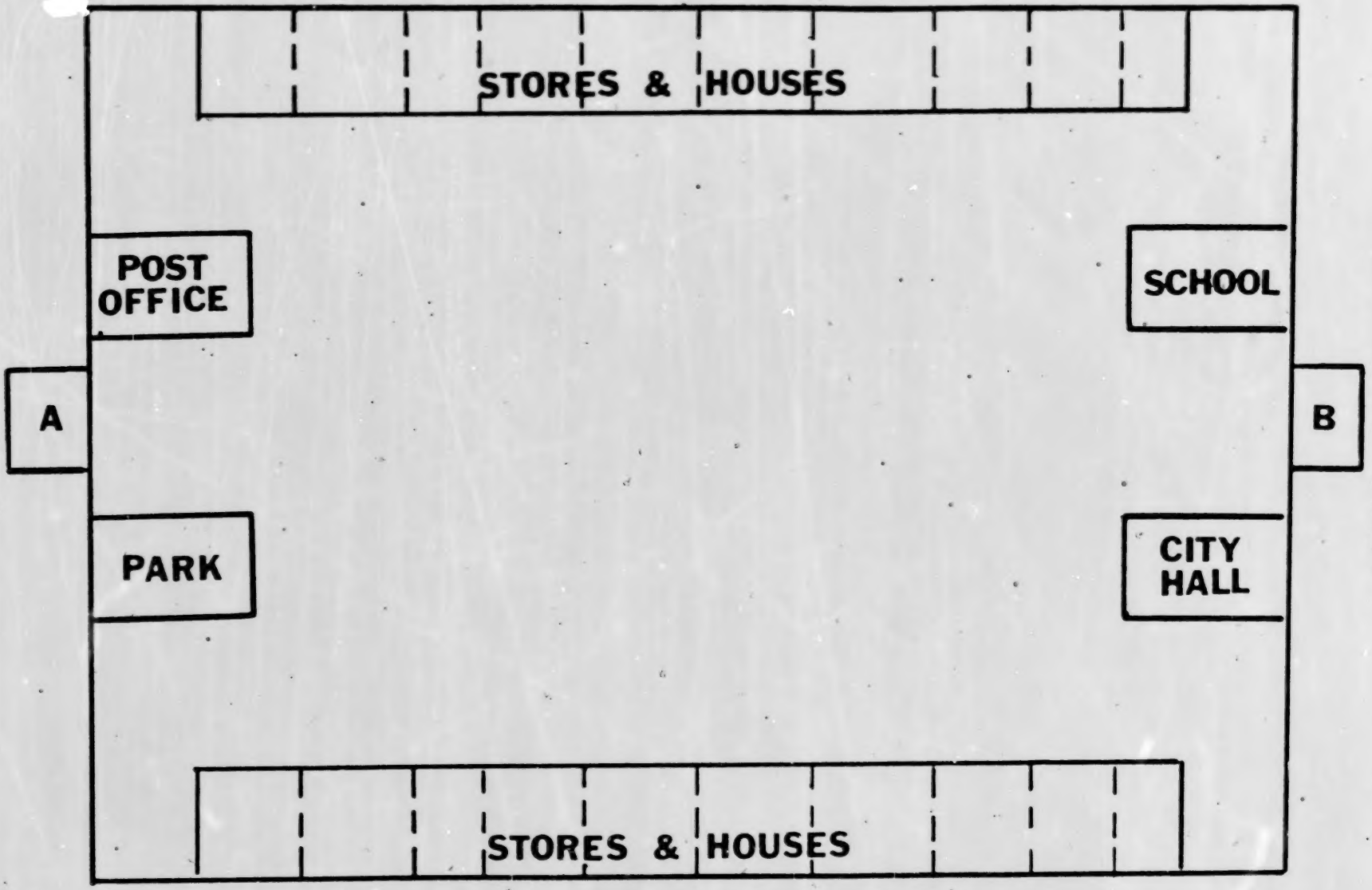

FIGURE I TOWN MODEL